

Factors Affecting The Control and Regrowth of the Nonindigenous English Cordgrass (*Spartina anglica*) in Puget Sound

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The English cordgrass, *Spartina anglica*, introduced into northern Puget Sound in 1961, is considered a class B noxious weed. Since 1997, Washington State Department of Agriculture (WSDA) Noxious Weed Control Board has been responsible for control of *S. anglica*. Control efforts involve mowing, hand pulling, and herbicide treatment using glyphosate Rodeo™. Approximately 10% of *S. anglica* has been removed in Puget Sound by WSDA since the eradication program began (Hacker and others., in press). However, very little information exists on the effectiveness of control or possibility for reinvasion. Some factors that may affect reinvasion include habitat conditions, dead *S. anglica* wrack, and control methodology. Our work addresses these factors in an effort to improve the eradication strategy and methodology.

Spartina anglica grows in four habitat types that include mudflats, cobble beaches, and low and high salinity marshes (Hacker and others, in press). We measured the pattern of re-growth following WSDA removal at a number of sites to understand its effectiveness in these habitat types. Percent cover, tiller number, tiller height, and flower number were measured during summer 2000 as indicators of regrowth.

Removal significantly reduces *S. anglica* regrowth (T.G. Reeder, S.D. Hacker, and M.N. Dethier, unpublished data). We found that, following 2 to 3 years of removal, *S. anglica* percent cover was reduced to 20 to 40%. With 5 years of control, *S. anglica* cover was significantly reduced to approximately 1%. In the four habitats monitored, tiller numbers ranged from 40 to 100/0.25 m². Following 5 years of removal, *S. anglica* tiller number was significantly reduced to ~ 8/0.25 m². *S. anglica* that has never been removed attains average heights of ~ 75 cm. Following 2 to 3 years of removal, *S. anglica* tiller heights range from 10 to 20 cm. *S. anglica* without removal produces an average of 12 to 15 flowers (spikes) per 0.25 m². Following 2 to 3 years of removal, flower production was significantly reduced to 0 to 2 flowers per 0.25 m².

To understand the processes controlling re-growth in more detail, we conducted an experimental manipulation during summer 2000. Three treatments and one control were established at two low salinity salt marshes in northern Puget Sound (Johnson Farm and West Pass). In one treatment, *S. anglica* was removed by mowing and spraying for 1 year only. In a second treatment, *S. anglica* was mowed and sprayed for 2 consecutive years. In a third treatment, *S. anglica* was mowed and sprayed for 1 year with wrack addition (dead, cut *S. anglica*). A control was established where *S. anglica* has never been removed. Percent cover, tiller number, tiller height, and flower production were the response variables.

We found that multi-year removal and wrack additions reduce regrowth (T.G. Reeder, S.D. Hacker, and M.N. Dethier, unpublished data). No difference in *S. anglica* percent cover was observed between 1 year

removal plots and plots without removal (near 100% cover). One year removal plots have the highest tiller count ranging between 100-175/0.25 m² in comparison to no removal plots with 90-125/0.25 m². Tiller height was reduced to ~ 60 cm as compared to ~ 75 cm in no removal plots. Fewer flowers (4-10 spikes/0.25 m²) were also produced as compared with no removal plots (12-15 spikes/0.25 m²). In 2-year removal plots, *S. anglica* cover was lower than no removal plots by about one-third. Tiller number (75-100/0.25 m²) was only slightly less than in no removal plots while tiller height was reduced to ~ 25 cm. Flower production was even lower at 1-5 spikes/0.25 m². In 1 year removal plots with wrack addition, *S. anglica* cover was lower by two-thirds compared to no removal. The fewest tillers were produced under this treatment (40-50/0.25 m²), and average height was further reduced to ~ 20 cm. No *S. anglica* flowers were produced.

The mechanisms controlling re-growth are unknown. We suspect that re-growth occurs due to carbon stored in the roots of *S. anglica*, which may not be killed by the herbicide treatment, even after several years. It appears that continuous removal reduces re-growth as witnessed by a reduction in *S. anglica* tiller numbers, tiller height, and flower production. Following 5 years of removal, very little re-growth is observed. The 1-year removal with wrack addition treatment also produced very little re-growth, likely because rotting *S. anglica* acts to smother above ground vegetation, drastically reducing re-growth.

Future research will explore additional factors such as soil conditions and plant neighborhood that may influence reinvasion. The effects of spraying and mowing on seed production and viability are unknown and will be considered as well.

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References

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